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A SPATIAL STUDY OF NETWORKING IN THE VISTULA LAGOON REGION USING GEOINFORMATION SYSTEMS

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Network cooperation — the most efficient form of unlocking the economic and natural potential of territories — is rapidly developing in Russia under the influence of global processes. Due to its unique geopolitical position, the Kaliningrad region is one of the regions where such networks develop at both the regional and international levels. When studying such forms of cooperation, the traditional methods of social sciences as research tools are not sufficient. It can be explained by the dynamic nature of network cooperation as well as by the fact that it involves a significant number of independent agents. We believe that one of the important tools of research on network cooperation is regional integral geoinformation systems (GIS). Modern GIS are successfully used in related fields, such as environmental and climate studies, geology, urban studies, and serve as rather efficient tools of analysing spatial objects and phenomena. One of such systems has been developed and is successfully functioning at the Immanuel Kant Baltic Federal University, which makes it possible to use it in studying network cooperation in the framework of cross-border development with the involvement of Kaliningrad municipalities. The key objective set by the authors of the article is to justify the need for studying the emerging network cooperation with the help of both traditional methods of geography and modern GIS; a specific case is made of the cross-border Vistula lagoon region — the one that brings together Russian and Polish municipalities. The authors provide with the background for the search of possible development strategies in the region, and note that the creation of a regional GIS structure can become a necessary component of the region's information and communication structure; this conclusion can be considered the key result of the research conducted. The practical significance of the article lies in justifying the use of modern geoinformation systems as a tool of territory development as well as for the purpose of making efficient managerial decisions at different levels.

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Introduction

In the Russian Federation, the public administration system has been undergoing certain changes, which manifests an objective reaction to the development of globalisation processes and attendant regionalisation. These changes are explained by the gradual transfer of strategic and operational management functions to the municipal level [1]. Today, economic and financial resources of municipalities are, as a rule, insufficient; however, the opportunities for efficient territorial management are increasing. In the framework of these trends, the structure of a territorial management system is changing: vertical connections (subordination) are being replaced by horizontal ones (equality), which is indicative of the development of networking among the territory's economic agents [2]. Networking is an efficient form of interaction, since it is based on the principle of cooperation and is beneficial for all agents [3]. The development of ramified multilevel networks is a powerful and efficient tool of territorial development: it can remedy its environmental or socioeconomic problems and, at the same time, strengthen its advantages. Efficient networking among economic entities contributes to progressive changes in the spatial structure of certain parts of national economy aimed at the creation of optimal environment for the population.

For the Kaliningrad region with its special geographic position and modest natural and socioeconomic resources, the development of networking can become an efficient instrument of territorial development. Moreover, it is important to emphasise that networking takes place both at the regional (among the region's economic entities) and international (with the bordering EU member states) levels.

The international project *Opportunities and Benefits of Joint Use of the Vistula Lagoon* financed by the European Neighbourhood and Partnership Instrument in the framework of the Lithuania — Poland — Russia Cross-border Cooperation Programme 2007—2013 focuses on studying and formulating the ways of developing efficient transboundary network cooperation, which should be based on a new strategy for the use of the Vistula Lagoon water and coastal areas.

Why is the Vistula Lagoon chosen as a research object?

The Vistula Lagoon is one of the two transboundary inland water bodies of the Russian part of the South-East Baltic. One part of the lagoon belongs to the Republic of Poland, the other — to the Russian Federation. The waters of the Vistula Lagoon and the adjacent territory are a site of various economic activities; the Polish part of the lagoon is used much more intensively than the Russian one. Historically, the coastal territory of the Russian Federation has been efficiently administered not only at the federal but also at the local level. However, over the last year, two important events took place. In the context of these events, the Vistula Lagoon can be considered a platform for the development of strong cross-border network cooperation.



The first event was the adoption of the Rules on the navigation of sports sailing vessels and leisure craft flying foreign flags through the inland waterways of the Russian Federation [4]. Of course, this circumstance enhanced the prospects of the economic use of the Curonian and Vistula Lagoons' water resources for the benefit of the region.

The second one was the inclusion of tourist in the priorities of the development of the Kaliningrad region [5]. In view of the geographic position of the territory, water tourism was named one of the most promising types of tourism. The Kaliningrad region boasts a dense waterway network and the access to the Baltic Sea and two lagoons. There is significant potential for the development of cruise tourism and inland waterway navigation. An international water route running from the city of Rotterdam (Holland) crosses the territory of the Kaliningrad region [6]. The dynamic development of this type of tourism in the region is hindered by the absence of necessary infrastructure and the presence of certain administrative barriers, whose elimination will facilitate the development of network cooperation and the attraction of private investors. It is the Vistula Lagoon that can and should become a platform for perfecting the mechanisms of efficient network cooperation among the municipalities and economic agents of Russia and Poland interested in the development of this territory [7].

The only reaction to all above circumstances was the search for the ways to intensify the integrated development of the Vistula Lagoon and the adjacent municipalities for the benefit of the Kaliningrad region and the contiguous Polish regions. This search resulted in the project entitled *Opportunities and Benefits of Joint Use of the Vistula Lagoon* (<http://vilaproject.eu>) [8], which was supported by the European Union.

The delineation of socioeconomic borders of the Vistula Lagoon region

From the perspective of socioeconomic geography, the Vistula Lagoon is not only its waters, but also certain coastal territories enjoying a direct economic effect from the use of the lagoon. How can one delineate this coastal territory of the Vistula Lagoon? One of the leading Russian specialists in studying coastal territories, G.G. Gogoberidze, claims that "a coastal territory can be considered and studied at different hierarchical spatial levels" [9]. He identifies four levels:

- global spatial;
- regional spatial;
- district spatial;
- local spatial.

According to the physicogeographical features of the Vistula Lagoon (a small area and relatively shallow depth), as well as those of the Kaliningrad region, the local spatial level was chosen as a research priority: the coastal territory consists of coastal territorial nodes — local coastal municipalities of the lowest administrative spatial level. Such coastal territories can be called nodal in the development and functioning of the economic complex of the coastal district and the coastal region [9].

Thus, the socioeconomic borders of the Vistula Lagoon (its Russian part) embrace the municipalities of the Kaliningrad region with immediate access to its waters. We believe that it is justified to extend the Vistula Lagoon region to the Pereslavl'skoye rural area of the Zelenogradsk district. This municipality lacks access to the sea but being susceptible to its economic effect, it actively participates in the increasing network cooperation.

As a result, the socioeconomic region of the Vistula Lagoon (its Russian part) brings together 10 municipalities of the Kaliningrad region (fig. 1).

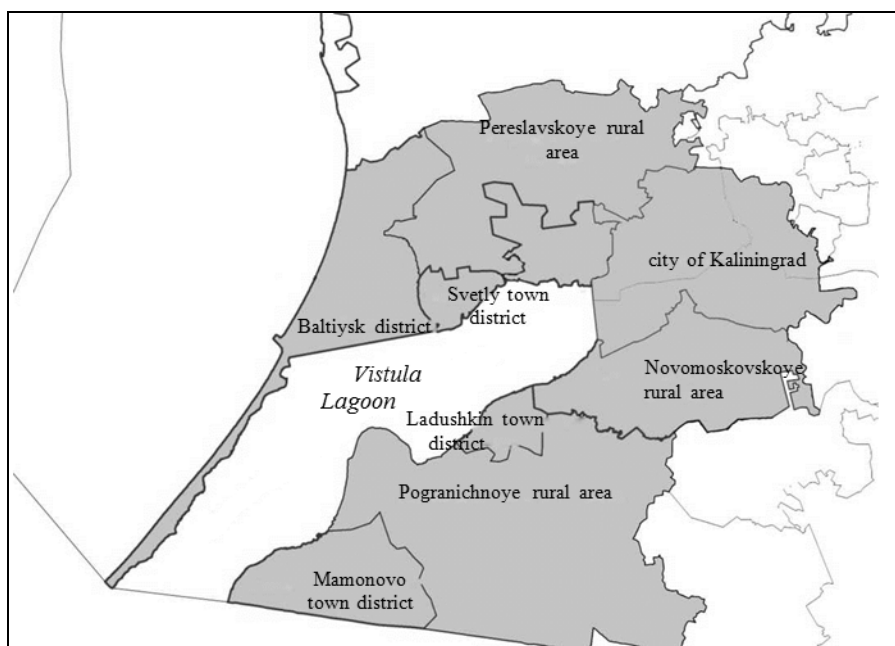


Fig. 1. Borders of the socioeconomic region of the Vistula Lagoon

Source: compiled by the authors.

A geographic information system as a tool for studying networking in the socioeconomic region of the Vistula Lagoon

It is well known that, as a science about the world, geography describes the whole diversity of natural and anthropogenic objects and processes on Earth. It gives humanity knowledge about current processes and helps us observe changes, forecast future events and systematise information for complex territorial planning and decision-making. Geography studies different spatial phenomena and their interconnections, which makes it possible to recreate the whole picture of the territory's condition and relations between its components, whose cumulative effect leads to the evolution of individual regions and the planet as a whole [10].

Modern geographic information systems (GIS) are computer technologies designed to organise and process spatial data, to model geographic processes, and to visualise data, models and processes. They also provide sets of special tools for processing and analysing geodata [11]. The modern geographic approach suggests using the principles of geography on the basis of GIS for understanding the world and applying geographic knowledge when solving current problems of human activities [12].

The key method of the geographic approach is the integration of a number of factors and their representation on the map, their comprehensive analysis and interpretation through cartographic juxtaposition of individual layers of data grouped according to a thematic principle. A good example is a map showing the capacity of landscape to accommodate a new object or a certain land use type when there is a need to take into account multiple features of the territory.

The improvement of a decision-making process is often connected with making the best decision when locating objects. Typical examples are searching for appropriate premises, choosing transport routes/corridors, planning and zoning, environmental protection, exploration and extraction of minerals, etc. At present, people — including top officials — understand that making correct and justified decisions about the appropriate location of a certain object serve as a guarantee of future success.

Today, GIS applications are generally used in the fields of ecology [13], geology [14], climatology [15], urban geography [16; 17] and transport system studies [18—20]. They can serve not only as a tool for analysing the emerging and existing spatial networks, but also as a mechanism for developing networking in the region. The opportunities for making a complex spatial analysis of a territory offered by modern GIS techniques can be used for taking optimal decisions on the development of the territory while maintaining the balance of interests of all economic agents operating within its scope.

A cutting-edge regional geographic information system called *The Kaliningrad Region* has been successfully functioning at the Immanuel Kant Baltic Federal University over the recent years. This GIS is based on the Arc View 9.3 software package with a standard set of additional modules (Arc-Catalog, ArcMap, ArcToolBox and Spatial Analyst) ensuring the conversion, projection and geoprocessing of data, overlay analysis, organisation of multi-page maps, etc. Such systems are being developed in many Russian regions [21; 22], which is indicative of their potential as a tool for strategic decision-making. The capacity of the GIS developed at IKBFU was demonstrated in the course of initial modelling of an anthropogenic load on the river basins of the Kaliningrad region and the calculation of an anthropogenic threat coefficient on its territory [23].

It is this system that can be applied in a complex analysis of the developing network cooperation within the socioeconomic region of the Vistula Lagoon. Fig. 2 shows a spatial scheme of current networking among the Russian economic agents of the socioeconomic region of the Vistula Lagoon in view of their infrastructural and economic relations.

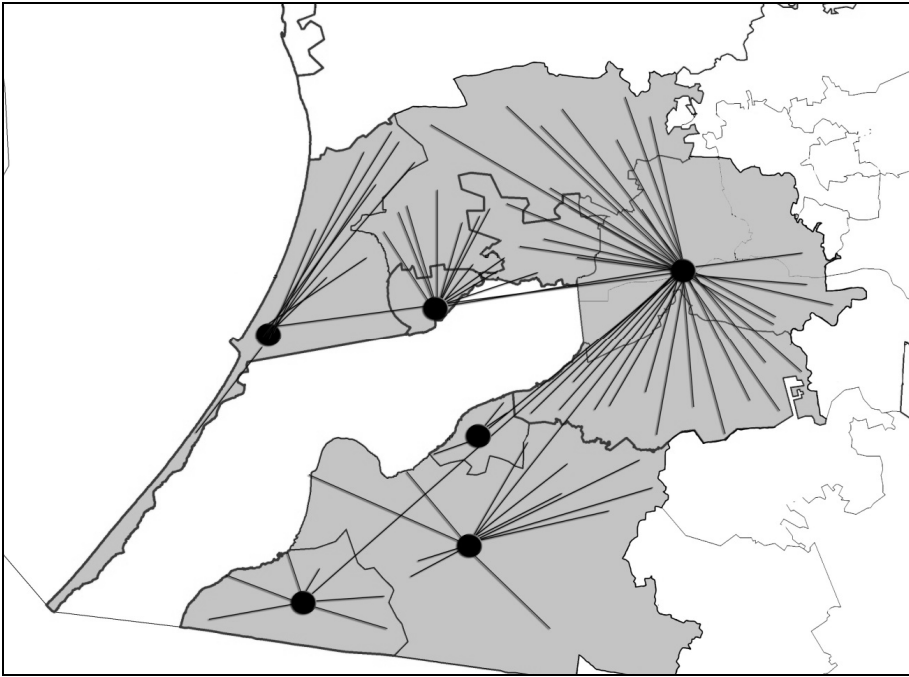


Fig. 2. Networking within the socioeconomic region of the Vistula Lagoon (Russian part), prepared with the help of “The Kaliningrad Region” GIS

Source: compiled by the authors.

In the framework of the ongoing study, it is planned to build a model of networking in the transboundary regions of the Vistula Lagoon, which will enable us to estimate the intensity of the already existing connections, on the one hand, and to develop a strategy for strengthening networking, on the other.

Conclusion

The Kaliningrad region is one of the few regions of Russia, where networking — a form of organisation of economic and sociocultural activities which is rather new for the country — is being developed and studied. A unique feature of the region is that international networking bringing together economic agents of the region and the neighbouring districts of Lithuania and Poland is developing alongside intra-region networking. Research methods and tools which are traditional for social sciences are not sufficient for the identification of such forms of cooperation, which is explained by a highly dynamic nature of networking and the involvement of a wide range of independent agents. We believe that regional integral geographic information systems will become an efficient tool of networking studies. The GIS, which is successfully functioning at IKBFU, makes it possible to carry out an in-depth study into networking within the emerging transboundary region of the Vistula Lagoon.

The search for new strategies for the development of the Vistula Lagoon region, that is carried out in the framework of the international project *Opportunities and Benefits of Joint Use of the Vistula Lagoon*, has revealed a need for the development of a regional integral geographic information system as a component of the information and communication environment. It can facilitate administrative decision-making, including that by interacting economic agents, in the process of achieving the key objective — the sustainable development of the socioeconomic space of the Vistula Lagoon.

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